Contribution ID: **116** Type: **Poster**

Nuclear-Powered Plasma CO_2 Dissociation for Deep-Space Electrostatic and Electrothermal Propulsion

Plasma-assisted CO_2 dissociation has been widely studied for in-situ resource utilization (ISRU) on Mars, where it is used to generate oxygen and fuel from the Martian CO_2-rich atmosphere. On Earth, the process has been explored for carbon capture and utilization, where CO_2 is utilized to produce valuable fuels and chemicals. Its application to space propulsion, however, is nearly unexplored despite the potential for enhancing the sustainability and autonomy of deep-space missions.

The feasibility of nuclear-powered plasma-aided CO_2 dissociation as a source of propellants in electric propulsion and as a route to in-space fuel manufacturing is investigated in this research. By combining high-power NEP reactors or fusion plasma sources with plasma dissociation, CO_2 dissociation byproducts, carbon monoxide (CO) and oxygen (O_2), can be efficiently ionized for propulsion. These ionized ions can then be utilized in Hall-effect thrusters, radiofrequency (RF) ion thrusters, and arcjet thrusters, which give a scalable, very efficient paradigm for propulsion in deep-space long-term exploration.

Author: LOPEZ, Natalia (Harvard University)

Presenter: LOPEZ, Natalia (Harvard University)

Session Classification: Poster session

Track Classification: Nuclear Physics Applications